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Informed Trust, Epistemic Dependence, Elitism, and the Challenge of Misinformation: A Response to Potvin et al. (2025)

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Abstract In this commentary, we respond to Potvin et al. (2025), explaining the flaws we find in their critique of our vision of twenty-first -century science education (Osborne & Allchin, 2024). Principally, our response argues that they have not considered fully the social nature of knowledge, our dependence on specialized experts, or how we cope with knowledge claims that lie beyond our ability to detect all possible sources of error. We argue that reliance on the expertise of others does not foster elitism; rather, it should engender respect for others who know more than we do. This does not imply deference but rather indicates a need to educate students in science media literacy and for them to learn precisely when and why such trust is justified, or well informed.

Résumé Dans ce commentaire, nous formulons une réponse à Potvin et al. (2025) en exposant les failles que nous relevons dans leur critique de notre vision de l'enseignement des sciences au XXIe siècle (Osborne et Allchin, 2024). Nous soutenons principalement qu'ils n'ont pas pleinement pris en compte la nature sociale du savoir, notre dépendance à l'égard d'experts spécialisés, ni la manière dont nous composons avec les affirmations scientifiques qui dépassent notre capacité à détecter toutes les sources d'erreur possibles. Nous sommes d'avis que le fait de s'en remettre à l'expertise d'autrui ne favorise pas l'élitisme, mais devrait plutôt susciter le respect envers ceux et celles qui en savent plus que nous. Cela n'implique pas une attitude de déférence, mais souligne plutôt la nécessité de mieux sensibiliser les élèves à la littératie médiatique scientifique et de leur apprendre précisément quand et pourquoi une telle confiance est justifiée ou éclairée.

Keywords Informed trust · Epistemic dependence · Expertise · Elitism · Misinformation

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Introduction

In a commentary in this journal, Potvin et al. (2025) critique our vision of "Science literacy in the twenty-first century: informed trust and the competent outsider" (Osborne & Allchin, 2024). They regard the very notion of "outsiders" as problematic and exclusive and contend that our views tend to support scientific elitism, blind trust, and unhealthy deference to authority. We show here how these concerns are misplaced and fail to acknowledge the critical competencies needed in our age of misinformation and populist trends that often urge non-scientists to "Do Your Own Research" (DYOR).

Epistemic (Inter)Dependence

First, Potvin et al. (2025) fail to acknowledge the distributed nature of knowledge in the twenty-first century. The days are long past when anyone could be a Renaissance polymath. In a world permeated with the division of intellectual labor, and where specialized knowledge is ubiquitous, the Enlightenment ideal of intellectual independence, embodied by Rousseau (1671) and others, is simply no longer possible. It is not that we "dismiss" this ideal (Potvin et al., 2025, pp. 543, 546), so much as think that it is now an unattainable, romanticized notion, borne of a bygone era. In our paper, we referred to the potent and cogent arguments of Canadian educator Stephen Norris (1995, 1997), who drew on the earlier work of philosopher John Hardwig (1985; 1991). Both challenged the notion of intellectual independence, which Norris (1995) characterized as "the capacity to judge for oneself the evidence for scientific claims to knowledge" (p. 210). Both explained the dilemma: that knowledge is validated and shared socially, hence, our inevitable epistemic dependence on others for most of what we know, including science and, indeed, all book-learning. This dependence was echoed in Noah Feinstein's (Feinstein, 2011) concept of the "competent outsider." In short, Potvin et al. (2025) fail to grasp this foundational premise of our article and its implications.

In addition, our cognition is bounded (e.g., Bromme & Goldman, 2014; Hertwig & Kozyreva, 2021). We can work to be expert in some things, but not all. Thus, in our culture, we are entitled to be wary of any would-be "know-it-all." Even scientists must rely on the expertise of other scientists. Over 500 co-authors were involved in the "observation" of the top quark in 1995. Over 5000 were credited as essential to determining the weight of the Higgs boson in 2012. In addition, 721 experts contributed to the 2023 IPCC report, each relying in part on all the others. Given this interdependence, we must develop in our students the competencies required to make informed judgments about whom to trust and why. Potvin et al. (2025), by contrast, simply *dismiss*—without evidence or argument—these concrete social and cognitive realities, imagining them to be irrelevant.

The existence of epistemic dependence may seem to leave us helpless. Hardwig (1985) describes the apparent puzzle:

> I find myself believing all kinds of things for which I do not possess evidence: that smoking cancer causes lung cancer, that my car keeps stalling because the carburetor needs to be rebuilt, that mass media threaten democracy, that slums cause emotional disorders… (Hardwig, 1985, p. 335)

Nevertheless, as Hardwig points out: "one can have good reasons for believing a proposition if one has good reasons to believe that others have good reasons to believe it … which does not constitute evidence for the truth of the proposition" (p. 335).

The question in an educational context is: what are those "good reasons" and how do we teach about them? How do we help students learn how to construct *informed*, or *justified*, trust in the knowledge of others? (Here, as elsewhere, we refer to *epistemic* trust, based on knowledge, not *interpersonal* trust,

based on moral qualities.) Informed epistemic trust requires an understanding of the nature of expertise and how an expert scientific consensus is formed, along with the competencies necessary to identify authentic experts or someone who can faithfully vouch for them. That is very different from assessing the evidence for oneself or the associated arguments, no matter how much research experience you may have in some other, unrelated field.

Elitism?

Second, does epistemic dependence imply elitism, as Potvin et al. contend? No. Accepting this equivalence is to disregard the ordinariness of our reliance on experts. The mechanics who fix our cars, the doctors who diagnose our illnesses, the lawyers who transact our house sales, the engineers who design our bridges and the welders who build them, the pilots who fly our planes and the ground crews who keep them in safe working order, the farmers who produce our food, and so on—all have bodies of expertise that we do not. This is simply the state of affairs that exists in contemporary everyday life. Yet we do not—as Potvin et al. (2025) would have us imagine—regard all these experts as "elites." Yes, they have "intellectual authority" within the sphere where their expertise is required. But intellectual "authority" is not *political* authority. Recognizing and respecting the legitimate expertise of others, as well as its limits, is, in our view, an essential component of learning to be a competent outsider.

Being informed about the criteria for epistemic trust also includes a broad understanding of the diverse types of scientific expertise. Expertise is not manifested exclusively by academics or professionally trained researchers (Allchin, 2012b). For example, expertise is not always documented by a record of peer-reviewed publications. Experience matters. In the 1980s, some AIDS activists developed sufficient knowledge of immunology and ongoing research on HIV to impress Veteran medical researchers and they all worked together on health policy and research (Epstein, 1995). Similarly, many Indigenous cultures exhibit extraordinary natural knowledge about local flora or fauna, or details of local ecosystem dynamics (e.g., Bass, 1990; Ludwig & El-Hani, 2025). For instance, "advanced" notions of agricultural intercropping and agroforestry, now regarded as progressive, originated anonymously in so-called undeveloped cultures (Allchin, 2019). Expertise takes a variety of forms. Yet few would consider these groups elites.

In contrast, our educational vision aims to build the competencies that will enable students to participate in democratic political discourse and to make personal lifestyle choices—as reflected now in the third competency found in the OECD PISA 2025 framework, which evaluates students' capability to "research, evaluate and use scientific information for decision making and action" (OECD, 2026, p. 23). Our vision seeks to engage diverse stakeholders rather than rely on a technocratic system that would place scientists in privileged decision-making positions. Nevertheless, socioscientific issues are best *informed by* good science. Students should be aware that an appropriate criterion of good science is a consensus of those with the relevant expertise (Oreskes, 2019), not an individual's private or "independent" impression or beliefs about the science. Thus, contrary to Potvin et al.'s claim that we insist on a "dichotomy between experts and non-experts" (pp. 543, 547), we seek to *reduce* the epistemic distance based on differing levels of knowledge, by fostering critical understanding and dialogue.

Potvin et al.'s alternative educational approach to trust—participating in a typical "research cycle" (pp. 549–550)—does not mean that every non-expert can be elevated to the status of expert discourse. For at best, it produces "marginal insiders" who, according to Feinstein (2011), are:

> students who have sat through a long parade of concepts and theories. If they are lucky, they may have had the opportunity to test their own hypotheses, present their own results, and critique each other's findings. Their understanding of science is fairly primitive, extending to experimentation

> but excluding probability and peer-review, and utterly neglecting the long and messy labors of authentic scientific work. A small number will go on to be real scientific insiders, but for most, this glimpse is all they will get. (p.???)

While we naturally concur that students should participate in inquiry and develop modest problem-solving competencies and appreciate the overall structure of empirical investigation, this is a poor model for confronting the real-world science that lies well beyond the boundaries of highly curated and artificially simplified School Science. The implicit promise that School Science can afford solutions to complex socioscientific problems using its handful of basic methods is grossly misleading. Rather, students need to gain a more realistic understanding of how reliable knowledge is produced, through exposure to episodes of real, complex, messy science—as illustrated, for example, through cases of historical inquiry (Allchin, 2026).

Potvin et al.'s proposal will not introduce students into insights of complex, robust science. Rather it will only nurture an individual's impression that they can, without expertise, develop expert-level judgments on their own. Such an impression reinforces the Dunning-Kruger illusion that we know more than we do (Ballantyne et al., 2022). Moreover, the focus on developing each student's reasoning ability promotes the notion that science is achieved primarily by enterprising or exceptionally talented individuals, and not by collectives of specialists who probe and vet each other's work. Science is fundamentally a collective activity based on a set of well-established social practices. This is precisely why we advocate teaching students about these practices, including critical discourse and the institutional structures for managing epistemic checks and balances—features of the nature of science now missing from virtually every standard science curriculum.

"But experts can be wrong!" critics like to say. True. Still, experts are far less likely to be wrong than non-experts. They know all the pitfalls of bad reasoning in the field. They know all the alternative hypotheses that have already been set aside. Moreover, individuals who rely on their own wits, rather than respecting the views of the relevant experts, are highly susceptible to confirmation bias and being misled by plausible but flawed arguments. Sadly, imbued with a sense of epistemic hubris, they often choose the path to "Do Your Own Research" (DYOR). Unfortunately, they then often decide who is an expert (and who is not) based on whether the claims "measure up to" their own prior conceptions. Consumers who follow this DYOR strategy prove to be *less* likely to reach conclusions consistent with the scientific consensus (Ballantyne et al., 2022). In general, non-experts simply do not have the intellectual resources to challenge an expert scientific consensus. If they did, they would be able to persuade the experts themselves. Much better, then, is to use secondary indicators to assess from the "outside" whether a consensus is "well formed" by active research and reciprocal criticism in a diverse community (Oreskes, 2019).

Submission?

Third, what are we to make of the contention that, by acknowledging the status of epistemic dependence in our culture, we thereby foster undemocratic postures of "deference" (Potvin et al., 2025, pp. 543, 545, 546), "submission" (pp. 545, 546), or "subservience" (p. 543)? In our view, a responsible epistemic agent acknowledges their own limits. They respect others who know more than they do, actively electing a posture of intellectual humility. Intellectual humility is the disposition required to recognize that your own beliefs and ideas might be mistaken (Pimentel & Osborne, 2026; Porter et al., 2022). Pritchard (2020) argues that it is an "other regarding virtue" and a form of respect—notably however, *not* "deference"—for the achievements and knowledge of others. Such respect does not mean forgoing epistemic agency or autonomy. Instead, recognising their own limits, the individual can still assess the credibility of the source using appropriate criteria of expertise and standard fact-checking techniques

(Allchin, 2025; Caulfield & Wineburg, 2023). They are still an active, responsible autonomous agent. Evidence suggests too that those with higher levels of intellectual humility are more likely to investigate claims, fact-check misinformation, and respect scientific expertise (Leary, 2018; Plohl & Musil, 2023). In short, they exhibit better epistemic behaviours and a greater commitment to evidence as the basis of belief—the foundational commitment of science (Siegel, 1989). Hardly would we suggest an attitude of blind "intellectual subservience and deference" (Potvin et al., 2025, p. 543).

Potvin et al. (2025) want experts to earn our trust. We agree. We disagree, however, on how trust might be earned. We do not focus abstractly on the individual methods and practices of science at a general level, which we assume as background. Rather, we are concerned concretely with specific claims, such as those that appear in public media. Such claims are especially problematic to evaluate when someone is confronted by science that lies beyond the boundaries of School Science. The challenge is compounded by imitators who pretend to have expertise but have none. Consumers and citizens thus have a formidable epistemic task: how do you sort fact from faux in the media, awash with pseudoscience and deceptive self-proclaimed experts? This is precisely why we turn to experts. We do not possess the background knowledge or experience to complete this demanding scientific task on our own. Our epistemic task en route to reliable knowledge is different from the scientist's: namely, to assess our sources of information, and the process whereby any particular knowledge claim arose (Goldman, 2001). This is a whole new set of competencies, or heuristics, that circumvent the need to wade through the technical details of every socioscientific issue we encounter. Again, this is the task that confronts each of us as an active epistemic agent. It is not passive "submission." The overlooked educational goal, as we see it, is to teach students how to perform this epistemic work and develop their capabilities in *science media literacy*.

Science-in-the-Wild: Misinformation

Fourth, and perhaps most importantly, Potvin et al. (2025) fail to address what we regard as the most compelling reason for rethinking science education in the twenty-first century: the widespread scientific misinformation in public media, outside the control of the scientific community—what we call "science-in-the-wild" (Allchin & Osborne, 2026). If scientific literacy in the Vision II sense of Roberts (Roberts, 2007) or the Vision III sense of Sjøstrom (Sjöström, 2024) is to be anything of substance, a first step must be to acknowledge that virtually all knowledge is mediated (Höttecke & Allchin, 2020). Accordingly, what are the criteria that enable trust—namely, judgments of the integrity and faithfulness of the communication itself? That applies even to a basic science textbook. Why should we trust what it says? Echoing Hardwig, what are the "good reasons"? It would be foolhardy to try to evaluate a textbook by trying to replicate the whole of the history of science yourself. Instead, you trust the authors, and the publisher—and the whole chain of transmitting knowledge back to the original research. Now, add to this the dilemma of mis- and disinformation flooding the internet and social media, confounding the provenance of any particular claim (Allchin, 2012a; Union of Concerned Scientists, 2019). How is the consumer of science to navigate science-in-the-wild? (Allchin & Osborne, 2026). Yes, authentic science is trustworthy. But *who speaks for science?* (Allchin, 2022). The primary, or most proximal, task in science media literacy is evaluating our sources of information. Understanding the social processes of mediation is essential to constructing informed trust when scientific claims appear "in the wild." Potvin et al. simply disregard the substantial epistemic difference between doing science, as a scientist, and interpreting prospective scientifically validated claims in the media, as a consumer or citizen "outside" science.

Managing misinformation is not really possible by a single person trying to leverage science on their own behalf. Fact-checkers, for example, are not scientists themselves. They do not need to be. As active

and expert epistemic agents, they know how to access the scientific consensus by navigating other sources; they are mindful of the origin of information and possess a deep understanding of what makes experts experts, and of what makes scientific consensus a trustworthy target. The process of separating fact from faux, like any form of learning, is riddled with layers of epistemic dependence, epistemic trust, and epistemic work. But, with appropriate knowledge of the landscape and of the architecture of trust, we, and our students, can begin to build a route to reliable knowledge (Allchin & Osborne, 2026).

In Conclusion

To conclude: we welcome critique of our ideas as "truth is the product of difference, not fond affinity" (Bachelard, 1968). At the same time, we feel that the critique by Potvin et al. (2025) was highly flawed and merited this response. Epistemic dependence and interdependence are ubiquitous in modern society and, contrary to Potvin et al.'s heartfelt conviction, the conventional ideal of intellectual independence is simply not achievable (section "Introduction"). Intellectual humility and respect for experts is not a form of submission, nor a stepping stone to elitism (sections "Epistemic (Inter)Dependence" and "Elitism?"). Rather, it is the first step to informed trust and exercising responsible epistemic agency. Knowing specifically when respect for science is deserved and why is an essential part of any education. This is especially important today, for consumers and citizens challenged with science-in-the-wild and misinformation vying in public media for legitimacy alongside reports of trustworthy science (section "Science-in-the-Wild"). If we indeed wish to foster each person's epistemic agency—a fundamental goal of science education—then we must help them learn how to navigate topics where they are *not* expert and how, even as "outsiders," they can competently access the reliable testimony of others.

Declarations

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